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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)

)
Amendment of Section 2.106 of)
the Commission's Rules to)
Allocate Spectrum for)
Wind Profiler Radar Systems)

ET Docket No. 93-59
RM-8092

To: The Commission

COMMENTS OF
THE SOCIETY OF BROADCAST ENGINEERS, INCORPORATED

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SUMMARY

The Society of Broadcast Engineers, Incorporated (SBE) opposes the proposed re-allocation of wind profilers to 449 MHz. Such an allocation would cause interference to Broadcast Auxiliary stations in the adjacent 450-451 MHz and 455-456 MHz RPU bands. Wind profilers should instead be allocated to 441 MHz, closer to the center of the 410-450 MHz government band. In the event wind profilers are nevertheless allocated to 449 MHz, there should be statutory provisions to ensure that the wind profilers are only located in "rural areas", and never within 50 kilometers of a fixed 450-451 MHz RPU station.

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To: The Commission

COMMENTS OF THE SOCIETY OF BROADCAST ENGINEERS, INCORPORATED

1. The Society of Broadcast Engineers, Incorporated (SBE), the national association of broadcast engineers and technical communications professionals, with more than 5,000 members in the United States, hereby respectfully submits its comments in the above-captioned proceeding relating to wind profiler radars ("wind profilers"). Specifically, the SBE objects to the proposed allocation of high-powered wind profilers centered on 449.00 MHz, only 1 MHz below the 450-451 MHz RPU Broadcast Auxiliary Remote Pickup (RPU) band. The SBE suggests that 441 MHz should be used instead.

**PROPOSED ALLOCATION OF WIND PROFILER RADARS AT 449 MHZ
WOULD CAUSE INTERFERENCE TO 450 MHZ RPU STATIONS**

2. The Notice of Proposed Rule Making (NPRM) proposes to allocate wind profiler radar systems from their present temporary location at 404.37 MHz to 449.00 MHz. The NPRM indicates that the reason for this proposed re-allocation is due to interference to the Cosmicheskaya Sistyema Poiska Avariynych (COPAS) satellites and to Search and Rescue Satellite-Aided Tracking (SARSAT) satellites that have

uplinks in the adjacent 406.0-406.1 MHz band.

3. However, the SBE notes that this allocation would provide only 1 MHz of separation from the 450-451 MHz RPU band, which begins with 10-kHz wide P channels at 450.01 MHz. The SBE finds it curious that the National Telecommunications and Information Agency (NTIA) thinks that relocating wind profilers that are causing interference to an adjacent band almost 2 MHz removed would somehow not cause interference to RPU receivers than would become only 1 MHz removed under the proposed re-allocation.

4. The NPRM makes reference to an NTIA report, "Assessment of Bands for Wind Profiler Accommodation", NTIA Report No. 91-280, September 1991 ("NTIA Report"). The SBE has obtained a copy of that report, which discloses the following technical parameters for the proposed Type A wind profilers:

- A. Two-hundred to three-hundred Type A wind profilers are planned nationwide (NTIA Report, Page 2-1).
- B. The bandwidth for Type A wind profilers is 2 MHz (NTIA Report, Page 2-1). The SBE notes that this specification appears to be inconsistent with Figure 3-3, Page 3-10, of the NTIA Report, which shows that the -3 dB points of a Type A wind profiler occur at less than ± 0.2 MHz of the wind profiler's center frequency.
- C. Type A wind profilers have peak transmitter powers of 40 kW (76 dBm), with an antenna half-power beamwidth (HPBW) of 4° (NTIA Report, Page 3-2)
- D. There is currently a demonstration network of 30 wind profilers, in the central United States. Ultimately a grid of 200 to 300 wind profilers will be formed across

the United States (NTIA Report, Page 3-4).

- E. Type A wind profiler transmitters have emission spectra equivalent to a 7-pole bandpass filter that is 3 dB down at ± 4 MHz (NTIA Report, Page 3-7). The SBE notes that this specification appears to be inconsistent with Figure 3-3, Page 3-10, of the NTIA Report, which shows that at ± 4 MHz from the wind profiler center frequency the radar emissions are 60 dB down.
- F. The main beam gain of a Type A wind profiler antenna is 32 dBi, or 29.9 dBd. The peak-to-average power ratio is 8.9 dB (NTIA Report, Table 3-2, Page 3-9). This means that the main beam effective radiated power (ERP) of a Type A wind profiler could be as high as $76 \text{ dBm} + 29.9 \text{ dBd} = 105.9 \text{ dBm} = 45.9 \text{ dBk} = 38.9 \text{ Megawatts}$, and that the average ERP could be as high as 37.0 dBk (5,012 kW). This is equal to the maximum ERP allowed a full power UHF TV station!
- G. The radiation pattern envelope of a Type A wind profiler radar antenna is as follows (NTIA Report, Page 3-9):

| <u>Angle from main beam</u> | <u>Gain</u> | <u>Relative Gain</u> |
|-----------------------------|-------------|----------------------|
| 0-2.5 degrees | 32 dBi | 0 dB |
| 2.5-15 | 10.7 | -21.3 |
| 15-30 | 0 | -32 |
| 30-60 | -10 | -42 |
| 60-85 | -20 | -52 |
| 85-90 | -25 | -57 |

This RPE is shown graphically in the attached Figure 1.

- H. The emission spectra for a Type A wind profiler is as follows (NTIA Report, Figure 3-3, Page 3-10):

| <u>Departure from center frequency</u> | <u>Relative Amplitude</u> |
|--|---------------------------|
| ±0.2 MHz | -4 dBc |
| ±0.5 | -18 |
| ±1 | -31 |
| ±2 | -46 |
| ±4 | -60 |
| ±5 | -72 |
| ±10 | -101 |

This occupied bandwidth spectra is shown in the attached Figure 2.

CALCULATION OF INTERFERENCE DISTANCE

5. From the above technical parameters gleamed from the NTIA Report, the SBE calculates that the average ERP in the horizontal plane from a wind profiler radar would be:

| | |
|-----------------|---|
| 76 dBm | peak transmitter power |
| 32 dBi | main beam antenna gain, at +90° (<i>i.e.</i> , straight up) |
| -2.1 dB | convert equivalent isotropically radiated power (EIRP) to ERP |
| -8.9 dB | convert from peak to average power |
| -57 dB | antenna response at -90° off axis (<i>i.e.</i> , at horizontal) |
| <u>40.0 dBm</u> | ERP at 449 MHz in the horizontal plane |
| -31 dB | emission spectra at ±1.01 MHz from wind profiler center frequency |
| <u>+9 dBm</u> | ERP at 450.01 MHz in the horizontal plane |

6. Now, assume a P Channel RPU receiver with a sensitivity of 1 μ Volt/meter, or 0 dBu, and a unity gain (0 dBd) receiving antenna. The distance at which an out-of-band wind profiler emission at 450.01 MHz is a threat is then given by the formula

$$D_{km} = 10\exp[(106.9 - (\text{Field Strength}_{dBu}) + (\text{ERP}_{dBk}))/20]$$

substituting a field strength of 0 dBu and an ERP of -51 dBk (+9 dBm) gives

$$D_{km} = 10\exp[(106.9 - (0) + (-51))/20] = 624 \text{ kilometers!}$$

7. This distance is grossly greater than the 15-kilometer threat distance for 450 MHz airborne RPU's given in Paragraph 13 of the NPRM. According to Footnote 21 to the NPRM, this distance comes from a supplemental NTIA study, "Enclosure 2", to a January 17, 1992, letter from the NTIA to the FCC, titled "EMC Analysis Between Type A Wind Profilers and Remote Pickup Broadcast Stations". Unfortunately, this supplement study was not included in the NTIA Report obtained by the SBE.

8. The reasons for this huge discrepancy in threat distances probably lie in the fact that the SBE calculations assume a peak transmitter power of 76 dBm (40 kW), as given at Page 3-2 of the NTIA Report, and not the lower power of 72 dBm (15.9 kW), as given in Table 3-2, Page 3-9, of the NTIA Report. Further, the SBE calculations assume that any detectable in-band (e.g., 450.01 MHz) signal from a wind profiler is a threat; the NTIA interference calculations may have arbitrarily assumed a particular signal level for the desired RPU signal (for example, 500 μ Volts/meter, or 54 dBu), and some arbitrary desired-to-undesired (D/U) signal ratio (for example, 20 dB) for which a wind profiler signal was assumed to not be a threat to a narrowband FM analog signal. For the two possibilities just given, the threat distance shrinks to

$$D_{km} = 10\exp[(106.9 - (34) + (-55))/20] = 7.9 \text{ kilometers}$$

which is the similar to the NTIA-derived distances.

9. Since the NTIA Report did not include the supplemental Broadcast Auxiliary interference study, the SBE is unable to determine what assumptions the NTIA made to obtain its relatively benign 2 to 15 kilometer threat distances. However, the SBE believes that the NTIA has significantly underestimated the distances at which wind profilers would be a threat to Broadcast Auxiliary 450-451 MHz RPU band receivers. The SBE believes that the 50-kilometer preclusion distance proposed for amateur repeater stations operating on a secondary basis in the 448-450 MHz segment of the band to be minimum separation distance from 450 MHz RPU stations that the Commission should consider.¹

10. Of course, all of the SBE calculations assume that the wind profiler emission spectra given in Figure 3-3, Page 3-10, of the NTIA Report, are, in fact, accurate. As previously noted in Items B and E, Page 2-1 of the NTIA Report indicates that the bandwidth of a wind profiler is 2 MHz, and Page 3-7 of the NTIA Report indicates that the emission spectra of a wind profiler transmitter is only 3 dB down at ± 4 MHz. If, in fact, the emission spectra of a wind profiler is only 3 dB down at ± 4 MHz, and not the 60 dB down shown in Figure 3-3 of the NTIA Report, then wind profilers at 449 MHz would devastate not only the 450-451 MHz RPU band, but also the 455-456 MHz RPU band, and cannot be allowed at 449 MHz. The SBE is proceeding on the assumption that the 2 MHz and 4 MHz figures in the NTIA Report are typographical errors, and should have read 0.2 MHz and 0.4 MHz, respectively. However, to ensure that 450 MHz RPU stations are protected, the SBE is proposing that the emission spectra shown in Figure 3-3 of the NTIA Report, and tabulated in Item E and Figure 2 of these comments, be written into any modification to Part 2 of the FCC Rules.

¹ NPRM, at Paragraph 12.

11. The SBE therefore proposes that Footnote US239 to Section 2.106 of the FCC Rules include a stipulation that

"The emission spectra of wind profiler radars must comply with the Low Altitude emission mask shown in Figure 3-3, Page 3-10, of NTIA Report 91-280, 'Assessment of Bands for Wind Profiler Accommodation', September, 1991."

WIND PROFILERS SHOULD BE ALLOCATED TO 441 MHZ, NOT 449 MHZ

12. The NTIA Report found two potential frequencies for wind profilers in the 420-450 MHz government band, 441 MHz and 449 MHz (NTIA Report, at Page 6-21). Although the report noted that Canada has already adopted 441 MHz for wind profilers, NTIA nevertheless concluded that 449 MHz would be a better frequency for wind profilers than 441 MHz, because wind profilers at 441 MHz would have "potential impact to military operations".

13. Apparently NTIA believes that while it would not be acceptable for government-operated wind profilers to impact other government stations in the same band, impacting RPU stations outside of the 420-450 MHz government band would be acceptable. SBE rejects this self-serving conclusion. If the federal government wants to find a new home for its wind profilers, and therefore some existing stations must be "impacted", then a frequency sufficiently inside the governmental band edges should be selected so that those "impacted" stations are other governmental stations, and not 450 MHz RPU stations, which, in their own band, are primary. At 441 MHz, 9 MHz removed from the lower RPU band edge, wind profilers are unlikely to pose a significant threat to Broadcast Auxiliary operations.

**NO GUARANTEE THAT WIND PROFILERS WOULD ONLY BE OPERATED IN
"REMOTE AREAS"**

14. As discussed above, the SBE believes that the best solution to potential interference from wind profilers would be to place wind profilers at 441 MHz rather than at 449 MHz. However, in the event 449 MHz is nevertheless chosen, the SBE wants to see some guarantees written into the proposed Footnote US239 to Section 2.106 of the FCC Rules, to ensure that wind profilers can never be located in populated areas.

15. Paragraph 12 of the NPRM states "In this regard, we note that NOAA indicates that wind profilers operating in the 400 MHz range are planned primarily for rural areas". Footnote 19 to the NPRM then goes on to note the Director of the NOAA as stating "...profilers will be built in rural areas where electrical noise is reduced and land is cheaper."

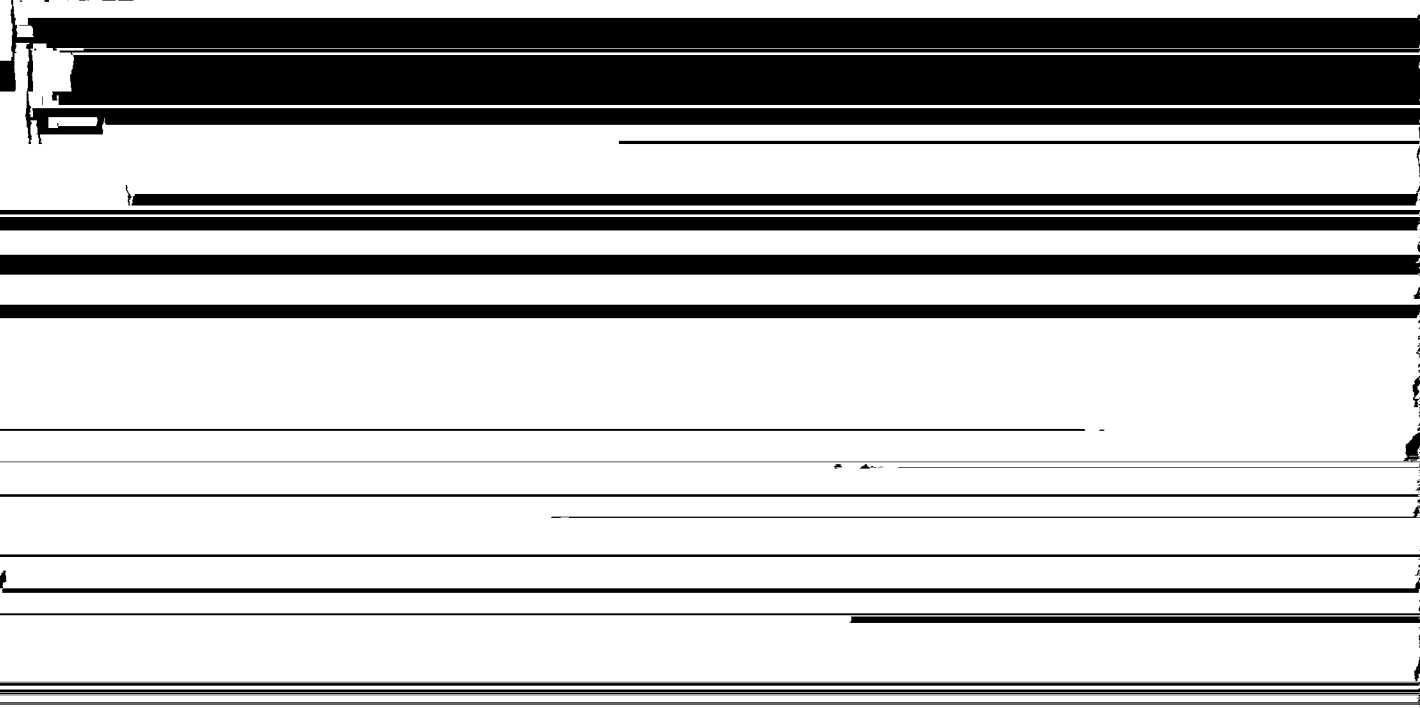
16. The SBE wants to see these assurances written into the FCC Rules. The SBE already has been informed that the first 449 MHz wind profiler radar was planned near a major population center. The SBE has reason to believe that until very recently the National Weather Service had planned to install a wind profiler radar station at Brookhaven Airport, New York. Brookhaven Airport is located in Suffolk County, is part of the Nassau-Suffolk Standard Metropolitan Statistical Area, and the airport is only 60 miles (97 kilometers) from New York City. The Nassau-Suffolk Counties comprise the Long Island radio market, which is the 14th largest radio market in the United States.² If this information proves correct, the National Weather Service could hardly have picked a more inappropriate location for its first 449 MHz wind profiler

² 1993 Broadcasting & Cable Yearbook, Page B-584.

station.

17. The SBE understands that this project got as far as laying out foundation stakes before the National Weather Service learned that the SBE and others were aware of this planned wind profiler station in a populated area, and is now denying the existence of the Brookhaven wind profiler. The SBE therefore proposes, in the event wind profilers are nevertheless assigned to 449 MHz, that Footnote US239 to Section 2.106 of the FCC Rules have a restriction that no wind profiler radar station may be located in any Standard Metropolitan Statistical Area (SMSA) as defined by the current Census of the United States, and further that no wind profiler station may be located within 50 kilometers of a fixed 450 MHz band RPU station. Broadcast Auxiliary stations operating at 450-451 MHz, where they are primary and not subject to sharing with government radiolocation stations, are entitled to a 50-kilometer protection zone.

18. Although these two restrictions will not guarantee that *mobile* RPU stations are not interfered with, any interference to mobile RPU's operating outside of all U.S.



WIND PROFILERS AT 915 MHZ

19. ET Docket 93-62 is also a Notice of Inquiry (NOI), regarding additional wind profilers at 915 MHz (specifically, 908.75 MHz to 921.25 MHz). Because this proposed allocation would be 29 MHz from the bottom edge of the 950 MHz Aural Studio-to-Transmitter Link (STL) band (944-950 MHz), the SBE sees wind profilers at 915 MHz as no threat to Aural STL's or Inter City Relay (ICR) stations. The SBE therefore has no objection to the NOI portion of ET Docket 93-62.

SUMMARY

20. SBE opposes the proposed re-allocation of wind profilers to 449 MHz. Such an allocation would cause interference to Broadcast Auxiliary stations in the adjacent 450-451 MHz and 455-456 MHz RPU bands. Wind profilers should instead be allocated to 441 MHz, closer to the center of the 410-450 MHz government band. In the event wind profilers are nevertheless allocated to 449 MHz, there should be statutory provisions to ensure that the wind profilers are only located in "rural areas", and never within 50 kilometers of a fixed 450-451 MHz RPU station.

LIST OF FIGURES AND EXHIBITS

21. The following figures or exhibits have been prepared as a part of these ET Docket 93-52 comments:

1. RPE corresponding to a Type A Wind Profiler Radar antenna
2. Occupied bandwidth of a Type A Wind Profiler Radar centers at 449 MHz.

Respectfully submitted,

Society of Broadcast Engineers, Inc.

By Richard Farquhar
Richard Farquhar, President

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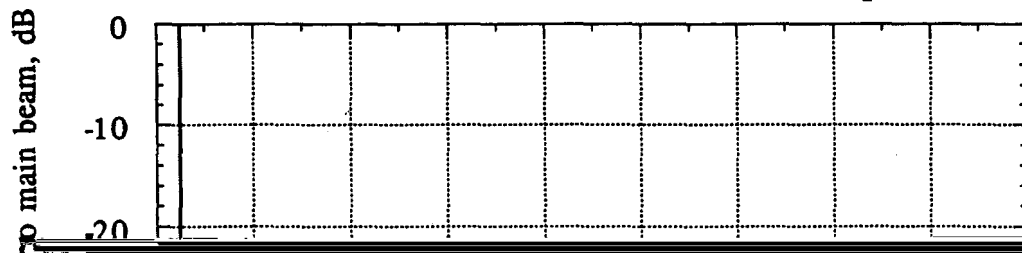
By Christopher D. Imlay
Christopher D. Imlay, Its Counsel

June 15, 1993

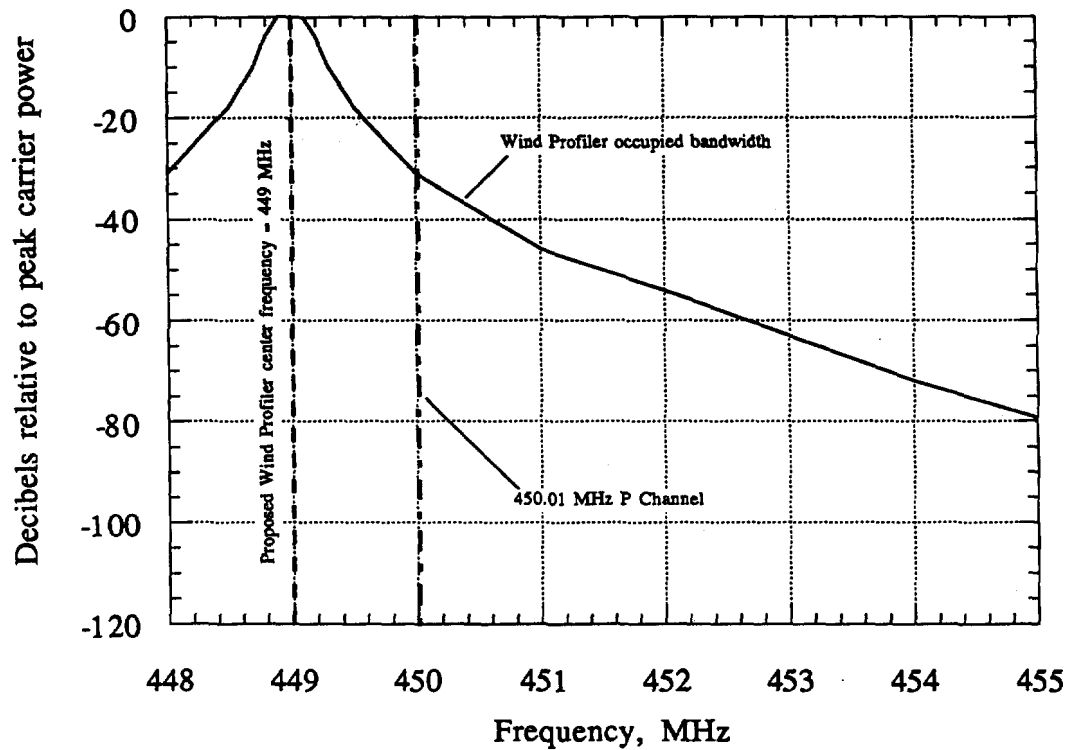
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SBE COMMENTS TO ET DOCKET 93-59

Type A Wind Profiler Radar Radiation Pattern Envelope



Occupied Bandwidth of a Type A Wind Profiler Radar at 449.0 MHz



Emission spectra derived from Figure 3-3, Page 3-10 of NTIA Report "Assessment of Bands for Wind Profiler Accommodation", Report No. 91-280, September 1991.

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